December 30, 2011

To the Science Advisory Board,

During the presentation of our oral comments on EPA's Accounting Framework for Biogenic Carbon Dioxide Emissions from Stationary Sources at the public meeting held on October 25th, NRDC was asked two follow-up questions by members of your Committee related to its recommendations for proper accounting of biogenic emissions from stationary installations.

1. Instead of scrapping the plan, what about the alternatives that EPA outlined in the report?
2. Some biomass producers argue that [an accounting framework for biogenic $CO_2$] has to be simple enough to administer. Does NRDC have any thoughts on how to make it simple enough?

Our basic response is that any accounting system for carbon emissions from biogenic sources must reflect what the atmosphere "sees", and that biogenic emissions should be counted initially like any other emissions.

If EPA determines that it has the authority to incorporate offsets under the Clean Air Act, emissions of biogenic emissions should be credited with an offset only to the extent it can be clearly established that the generation and harvest of biomass for energy production by a covered facility results in a genuine expansion of the carbon sink in the forestry operation from which that facility is sourcing biomass—for example, through the generation of additional plant growth and associated carbon absorption—or in the reduction of a carbon emissions source—for example, through reduced emissions from decomposing residues.

Diminishing a carbon sink is the same as increasing carbon emissions from the perspective of the atmosphere. Power plants burning biomass cannot be given credit for forest growth and carbon sequestration that would be happening anyway without increasing net carbon emissions to the atmosphere. Only when bioenergy results in *additional* carbon sequestration—for example, through better forest management that verifiably increases biomass growth in the forestry operation in question—can discounting some or all of bioenergy's carbon emissions be justified.

EPA's proposed framework violates this principle by crediting bioenergy with forest growth and carbon absorption that would occur anyway. Restricting the regional area, or restricting this accounting to "managed forests" does not solve this problem. All U.S. forests are considered "managed" for UNFCCC purposes, and forests in nearly all regions are accumulating carbon due to regrowth from historic harvests, and likely the effects of carbon and nitrogen fertilization.

Regional accounting only complicates the challenge of isolating the effects of bioenergy production on forest carbon. Regional changes in carbon stocks will respond to an enormous range of factors unrelated to bioenergy production, including weather, disease, and global market dynamics. The heterogeneity of forest types within the U.S. only increases this challenge.

Spatial averaging of carbon stocks across a region does not reflect the consequences of additional tree harvest. If the different portions of a region's forests are harvested at the same level, and with the same management regime – and absent any uncontrolled external events, such as disease – changes in carbon stocks over space will mirror the carbon stocks over time. But that principle says nothing about the carbon consequences of increasing the harvest for bioenergy, e.g., harvesting trees that would not otherwise be harvested. Nor does it indicate the global consequences of diverting U.S. timber harvests to bioenergy from alternative uses.

The most straightforward approach to estimating the carbon consequences of bioenergy is to estimate the effect of the bioenergy harvest itself. This approach starts by counting the smokestack emissions from burning all biomass.

To the extent that EPA determines that some biomass is "low carbon" within the timeframe over which the agency is interested in reducing emissions, emissions from this material may be discounted. Such material must consist of "additional" biomass, meaning biomass that, absent bioenergy, would not be generated by plant growth or would decompose and give off its carbon to the atmosphere anyway. A covered facility should be required to demonstrate through chain of custody[1] that carbon emitted as a result of its bioenergy production is being offset by *additional* carbon uptake in the forestry operation from which that facility is sourcing biomass.

The analysis of biomass can then be based on various categories:

*Presumptively low carbon biomass, such as mill or forestry residues* – Waste biomass that would otherwise decompose in situ constitutes a category of low carbon biomass assuming it would not otherwise be used, and its harvest does not undermine forest growth or deplete forest carbon stocks. EPA can establish regional default values for biomass that fits into this category.

*Whole tree harvest site analysis* – Any accounting scheme that takes credit for biological sequestration of carbon must also recognize the loss in sequestration that occurs when forests are cut for fuel. When trees are harvested, the reduction in carbon stock in the forest is primarily reflected by the emissions of carbon from the smokestack. However, to the extent that regrowth of the forest accumulates carbon at rates that exceed the growth rate of the forest if not harvested for bioenergy, this increased rate of accumulation offsets some or all of the smokestack emissions over time.

Assuming that the system starts by counting biogenic emissions from smokestacks, the bioenergy emissions can be calculated using the following equation:

(a) Bioenergy carbon emissions *initially* = carbon emitted from the smokestack

[1] A process that tracks fiber back to the forestry operations that the facility is sourcing from.

(b) Over time, as forests regrow, net biogenic emissions =

(c) Carbon stocks the forest would hold if not harvested for bioenergy
**minus**
(d) Carbon stocks in the forest harvested for bioenergy

The carbon stock figure in line (c) does not reflect the carbon stocks in the forest pre-harvest, but rather the carbon stocks the forest would hold if not subject to a harvest for bioenergy at any point in time as the forest cut for bioenergy regrows. This equation therefore recognizes the loss in forest carbon sequestration that occurs when forests are cut for fuel, but also recognizes that regrowth eventually compensates for the emission as the difference between the cut and uncut forests diminishes through time. Carbon sequestered in the regrowing forests constitutes an offset of the carbon that was initially emitted by cutting and burning the wood for fuel. This offset is small to begin with, but increases over time.

This equation, and therefore the level of offset, will vary across time. Obviously, at the immediate moment of harvest for bioenergy, there is no re-growth and so no offset can be generated.

As an administrative matter, this calculation will also require a direct chain of custody between the type of biomass, landscape changes, and the emitting facility.[2]

The estimation of forest carbon stocks with and without bioenergy harvest must rely on forest growth models, as demonstrated by several papers.[3] Although the use of these models involves some uncertainty, any alternative is far more uncertain. Any alternative that involves actual site-level carbon measurements would still require estimates of the carbon stocks in the absence of bioenergy using a model. Further, when comparing that carbon to actual forest carbon levels, this method would require factoring out all other effects on forest carbon stocks, such as weather, disease and changes in market effects on timber harvests.

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[2] It is also important to recognize that the carbon losses in the forest initially exceed the biogenic carbon emitted from smokestacks because not all felled wood is harvested for energy. Remaining residues and dead rates also emit carbon as they decay. Over time, however, the regrowth may repay the carbon debt. The point in time at which regrowth begins to repay carbon debt, and fully repays that debt, depends on the type of forest and harvest strategy.
The quantity of carbon in the forest, if not harvested for bioenergy, should reflect the likelihood that fire or disease could reduce the carbon stocks. That probability must be estimated, and the estimation of carbon stocks reduced by a weighting of this probability.

[3] Studies include: T Hudiburg et al. (2011), Regional carbon dioxide implications of forest bioenergy production, *Nature Climate Change* DOI 10.1038 (published online 23 October, 2011); J. McKenchnie et al. (2011), Forest bioenergy or forest carbon? Assessing trade-offs in greenhouse gas mitigation with wood-based fuels, *Environ. Sci. Tech*. 45:789-795; B. Holtsmark (2011), Harvesting in boreal forests and the biofuel carbon debt, *Climatic Change* doi 10:107/s10584-011-0222-6 (published online August 26, 2011); Manomet Center for Conservation Sciences (2010) Massachusetts Biomass Sustainability and Carbon Policy Study: Report to the Commonwealth of Massachusetts Department of Energy Resources. In Walker T (ed) Natural Capital Initiative Report NCI-2010-03. Brunswick, ME, USA

Those harvesting timber for bioenergy may also generate an offset by planting trees in their forestry operation, or by changing forest management in the operation to sequester more carbon. That additional carbon sequestration can constitute a legitimate offset if it is truly additional. Such an analysis must also account for leakage depending on the type of land planted, such as the land use change that will occur to replace any lost food production or reduction in timber products harvested.

Ultimately, accurate accounting must reflect what the air sees as a result of the bioenergy harvest. Covered facilities should not be allowed to free ride on forest growth in their region that would occur anyway. The approach laid out above would instead link the emitter directly to what's happening on the landscape, creating the necessary market incentives to encourage bioenergy facilities to source low-carbon biomass and burn it efficiently.

Sincerely,

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